

The Business of Supplying the Army

**A Monograph
by
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Abstract

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The United States Army continues the transformation process to the Future Force. As the transition continues, the Army must balance the sustainment requirements of the soldiers in the field with the desire to reduce the logistics tail of the force and make a smaller, more strategically deployable force. To do this the Army has turned to civilian business practices to adapt ways of increasing efficiency in the distribution system.

To understand the ideas that the Army was adapting, this study looked at civilian distribution systems. It reveals that civilian business practices are effective because they integrate many key pieces into in a system that produces results when operated effectively. This is what the Army wants to achieve.

A review of the Army's sustainment operations in OIF revealed that the Army failed at its initial attempt at incorporating civilian business principles into its sustainment operations. The Army failed because it did not provide sufficient focus on actually establishing the system at the start of operations. In addition, the Army has not demonstrated the commitment to providing the resources that are necessary to achieve success.

The potential exists for the Army to be successful in adapting civilian practices. The answers lie in correcting the command structure of the theater logistics organization, investing in the hardware that soldiers need to accurately track and manage supplies as they do in civilian systems, and in establishing the theater sustainment structure early in the process. The Army should continue to pursue transformation of the sustainment system with the focus on accepting that there are compromises that must be made between efficiency and effectiveness.

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Chapter One: Introduction

The United States Army is currently transforming to the Future Force. The Future Force concept envisions a strategically lighter more logistically sustainable force. The Transformation Campaign Plan (TCP) describes aggressive capabilities for the Future Force. The Future Force will operate in battle space that is significantly greater than what is expected of current U.S. forces and is dependent on the ability to leverage new technologies that will allow it to achieve existing levels of lethality with less of a logistics burden than our current force requires. The Future Force focuses on the following characteristics: responsiveness, deployability, agility, versatility, lethality, survivability, and sustainability¹. Most of these characteristics are improved with evolutionary improvements to different weapons systems and equipment. If evolutionary improvements to the equipment and doctrine are made then improvements in capabilities should follow. But the current TCP brings a degree of uncertainty about how the Future Force will operate. The Army intends to make a revolutionary change to the way it fights. The Army is fielding new equipment and writing new doctrine to meet the requirements of the Future Force. To meet the sustainment challenges that are involved with changes to the Future Force, the Army is also changing the way that it sustains the force. As the doctrine for the Future Force continues to develop, a tension exists between the desire to take advantage of new technology to expand the operational reach of the Future Force and the reality of what is logistically possible to support.

The Army has borrowed concepts from civilian industry in looking at how it will make the transition to the Future Force. There are benefits to adopting civilian business practices. The Army seeks to gain increased responsiveness, reliability, and efficiency while saving money through the use of proven business practices to enhance the Army's sustainment system.² The benefits are welcome and as stated, will improve the Army's sustainment system. But there are challenges to

¹ United States Army Training and Doctrine Command. TRADOC Pamphlet 525-4, The United States Army Objective Force Maneuver Sustainment Operational and Organizational Concept. Fort Monroe, 2003: p16-18.

² Wang, Mark Y.D. *Accelerated Logistics: Streamlining the Army's Supply Chain*. (Santa Monica: Rand, 2004) xi

making the changes from a system built around ensuring effectiveness to a system that is driven by efficiency.³ There are inherent risks involved in taking a system designed to operate in a static environment and using it in a hostile military environment where opponents have a vested interest in disrupting your ability to operate efficiently. This study examines some of the business principles involved in developing the Army's new Velocity Management (VM) initiative and looks at how they are adapted in a hostile environment.⁴

Methodology

This study asks two questions. The first question is can the Army effectively employ procedures that work in a civilian environment in a military setting. The second question is does the current TCP neglect the impact of friction on the battlefield with regards to logistics sustainability. Civilian systems are designed to handle rapidly changing economic environments and competition from competitors. They are not designed to withstand direct physical attacks or operate in places where they have not had an opportunity to establish their supply centers and transportation networks. This study questions their effectiveness in a combat environment. In order to answer the research questions this study will look at Army sustainment operations in its last major combat operation; Operation Iraqi Freedom (OIF). In 1991 the Army conducted Operation Desert Storm (ODS). Operation Desert Storm represents the "Just in Case" (JIC) logistics approach. Just in case logistics meant that commanders would pre-stock supplies prior to beginning combat operations and have most of what they might need in the event that a particular item was required. The sustainment operations in ODS were not without problems but they did allow the Army to accomplish operations over the short period of combat.⁵ Despite this, the Army left ODS recognizing that it needed to change to a different system.

³ Ibid, xi

⁴ Wang, Mark Y.D. *Accelerated Logistics: Streamlining the Army's Supply Chain*. (Santa Monica: Rand, 2004), v

⁵ United States General Accounting Office, "Transportation and Distribution of Equipment and Supplies in Southwest Asia". Washington, D.C., 1991

This study looks at some of the civilian practices that were the impetus for changing the Army's system. To do this, civilian practices are examined to gain an understanding of the principles that are the foundation for civilian distribution systems. This study will then look at one example to see how they employ some of the distribution processes that the Army is adapting. Wal-Mart was one of the industry pioneers in instituting velocity management. Wal-Mart's distribution system is examined to gain an appreciation for some of the elements that make it such a successful system. This will also help to gain an understanding of some of the critical concepts behind VM.

After looking at Wal-Mart, this study looks at the Army's attempt to incorporate VM. Operation Iraqi Freedom provides the opportunity to do this. OIF does not represent the endstate for where the Army's logistics system is going with transformation. But OIF does represent our first attempt at major combat operations since VM was introduced. The Army started using VM in 1995 and has enjoyed considerable success using VM in a garrison environment.⁶ This system was tested in OIF. OIF provided some insight to future problems that we may see with VM in a hostile environment. This study looks at some of the problems that were experienced in OIF and the impact that these problems had on troops during that operation, and future implications for the use of VM. This study also examines the impact of terrorist attacks on September 11, 2002 and other recent natural disasters on VM systems in the civilian sector.

The evaluation criteria are taken directly from the Future Force TCP. Sustainment, Agility, and Survivability are some of the primary characteristics that are stressed in the Future Force concept documents.⁷ These concepts are defined in the TCP White Paper and in TRADOC Pamphlet 525-4-0. A review of these terms is necessary to ensure clarity and to narrow the focus of this study. TRADOC Pamphlet 525-4-0 describes agility as the ability to transition rapidly with

⁶ Mark Y.D. Wang *Accelerated Logistics: Streamlining the Army's Supply Chain*. (Santa Monica: Rand, 2004), 2

⁷ United States Army Training and Doctrine Command. TRADOC Pamphlet 525-4-0, The United States Army Objective Force Maneuver Sustainment Operational and Organizational Concept. Fort Monroe, 2003, 16-19

minimal adjustments, whether at the tactical, operational, or strategic level. For this study, we will focus on the tactical and operational levels. TRADOC Pamphlet 525-4-0 explains that by seizing the initiative and seeing, understanding, and acting first, the Objective force will enhance its own survivability. Maneuver sustainment survivability in a non-contiguous operational environment is achieved, in part, through mobility. For this study, the ability to protect soldiers and supplies from interdiction along the LOC's will define survivability.

Sustainment is defined as the ability to provide the UA commander with the required supplies to accomplish his mission. For this study we will focus on classes of supply I, III, V, and IX. These criteria are the focus because they are the things required for soldiers and equipment to operate on a daily basis and traditionally require daily re-supply. These items are most likely to stress the Army's system of re-supply for the UA. The challenge for the Future Force is to safely and efficiently move supplies forward to units over extended distances on a non-contiguous battlespace.

Scope and Limitations

The Future Force UA doctrine and organizational structure are not firmly established. The Army continues to develop doctrine and equipment to support the new concept. The concept of support for the Future Force continues to develop with the Army's G4 taking the lead in formulation of the supporting unit structure and doctrine.⁸ Because of the ongoing nature of the development of the Future Force, this study assumes that development and employment of the force will continue as outlined in draft documentation from TRADOC. Because there are various places to find information on the UA, for consistency, this study will use TRADOC 525 series pamphlets as the primary source of information on the Future Force.

This study focuses on major combat operations (MCO). The reason for the focus on MCO is that these are the most dynamic types of operations that the Army conducts and they

⁸ Wang, Mark Y.D. *Accelerated Logistics: Streamlining the Army's Supply Chain*. (Santa Monica: Rand, 2004), 2.

provide the greatest challenges for sustainment. While peace keeping and peace enforcement operations offer unique challenges to the UA, they generally occur in more static environments with less of a need for offensive movements covering extended distances. This study does not attempt to validate or invalidate the specific organization of the UA or the supporting unit organization. This study does not focus on the structural specifics of the UA. The focus here stays on the conceptual application of civilian concepts in a tactical environment.

Chapter Two: Civilian Concepts

The just in time system of delivery was pioneered by Japanese manufacturing firms. U.S. companies began adopting VM in the 1980's. The incentive for the U.S. firms that adopted this new concept was that it allowed them to cut slack and waste from their supply chain networks and increase profits. Inventories of both raw materials and finished goods are reduced and the capital required to maintain previously large stockpiles is diverted to more profitable applications.⁹

Distribution of supplies is the central issue of this paper. But the distribution system cannot be looked at in isolation. The distribution system is only one of the parts of the overall supply system that ultimately delivers the goods to the Soldiers. In examining civilian distribution practices there are three common parts that define the system. The first part is a data sharing system that allows total asset visibility of supplies at different levels. The second part is a warehouse distribution facility that manages the flow of supplies to local vendors. The third part is dedicated transportation that moves supplies from the warehouse to the vendors.

Asset visibility is critical to the success of VM. Through the use of computerized tracking systems, suppliers are able to monitor stockage levels of supplies on the shelves of a store. A prerequisite of stock control is that accurate records are kept of the movement of all items. This requires that records of stock levels, demand, usage, placement of orders, etc. should be updated when any action is taken involving a particular item of stock.¹⁰ The advent of Stock-keeping units (SKU) or line items, meant that different types and sizes of products now had an individual identification code and could be managed more closely.¹¹ Having visibility of the detailed inventory levels of their customers allows suppliers to anticipate requirements and adjust production as needed. Having suppliers linked to the inventory allows retailers to keep lower stock levels which

⁹ Charla Griffy-Brown, "Just-in-Time to Just-in Case: Managing a Supply Chain in Uncertain Times." *Graziadio Business Report*. No 6, (2003)

¹⁰ Martin Christopher, *Marketing Logistics and Distribution Planning*. New York: Halsted Press, 1972, 183

¹¹ James Johnson, et, al., *Contemporary Logistics*. Upper Saddle River: Prentice-Hall, 1999, p8

reduces the need for large amounts of storage space and large piles of product in a storage room. This in turn leads to reduced cost for the retailer who does not have the burden of managing large stockrooms of supplies waiting to get on the store shelf.

Warehouse distribution centers are the second part of the system. Warehouses are strategically placed and serve as a consolidation point for supplies in route to the retailers. Warehouse distribution systems today are automated structures that are the hub for all supplies that are eventually shipped to retailers. But the distribution centers in a VM system are not places where bulk quantities of supplies are kept and parceled out to retailers as needed. Distribution centers in a VM system often use cross-docking to minimize the amount of time that products spend in the warehouse. Cross-docking is the process of receiving supplies from an inbound supplier's truck and sending the supplies that it delivered directly to a shipping dock where they are loaded onto an outbound delivery truck for movement to the retailer, instead of putting it onto a storage shelf. This reduces the amount of storage space that is needed at the warehouse and it reduces the overhead that is required to run the warehouse. VM systems take advantage of speed. But the speed does not come from the rate of movement of a particular vehicle. The speed is generated by reducing the amount of "non-movement" time. The time that would be spent in a warehouse in sorting packages and storing them is eliminated through cross-docking.¹² Items that have a high demand history or seasonal surge items are kept in higher quantities at the warehouses so that they can rapidly adjust to consumer demands.¹³ Automated systems and advanced machinery are parts of modern warehouse distribution centers but the most important element of the system is the people that run it.¹⁴

¹² Christopher, Marketing Logistics and Distribution Planning, p132

¹³ Ibid, p195; James Johnson, et al., *Contemporary Logistics*. Upper Saddle River: Prentice-Hall, 1999, p305

¹⁴ Joseph D. Patton Jr., *Logistics Technology and Management*. New York: The Solomon Press, 1986, 233

The third part of VM systems is a reliable transportation network. VM is largely based on the certainty of supplies moving through the system. Since on hand supplies are intentionally kept at a low level, a constant flow of materials is required. VM systems benefit from having reliable methods of transportation from their suppliers to the distribution centers and from the distribution centers to the retailer. Interstate transportation networks, the rail network and reliable air transportation benefit VM systems. To further increase the certainty and control of their system, many large corporations such as Wal-Mart have their own internal truck fleet for delivery to retailers.

The Wal-Mart Concept

What began, as a small family store back in 1962 is now the world's largest retailer.¹⁵ Sam Walton, the founder of Wal-Mart recognized in the eighties that distribution was the key to the continued growth and success of his company. Wal-Mart's distribution system is what allowed it to outpace its competitors and become the giant in the retail industry.¹⁶ Wal-Mart's strategy focuses on the replenishment of inventory through cross docking. Cross-docking helps Wal-Mart avoid inventory and handling costs and results in a reduction of costs that is passed to the consumer in the form of lower prices. Wal-Mart uses a complex computer system that links its distribution centers, suppliers, and stores and allows information on stockage levels to be transmitted automatically between the three. Through the use of Vendor Managed Inventory (VMI), Wal-Mart has effectively put it's suppliers in charge of managing inventory.¹⁷ Wal-Mart suppliers who participate in VMI actually control when and how much of their own supplies Wal-Mart will re-order. This is all made possible by a private satellite communications system and a fast and responsive transportation system. There are currently more than 10,000 Wal-Mart suppliers who use this retail

¹⁵ Damon Schechter and Gordon Sander. *Delivering The Goods; The Art of Managing Your Supply Chain*. Hoboken: John Wiley and Sons, 2002, p228

¹⁶ Sam Walton, *Made in America: My Story*. New York: Doubleday. 1982, p208-209

¹⁷ Schechter, *Delivering the Goods*, p160

link system to monitor sales and inventory.¹⁸ The automated systems that manage Wal-Mart's inventories are impressive and very important to the overall success of the company, but they are not the critical piece of Wal-Mart's success.

Wal-Mart's automated systems are no more impressive than the systems of many other major corporations in America. Business such as Black & Decker, Nike, and Duracell all use automated systems to manage orders and shipping.¹⁹ The key to the success of Wal-Mart lies in the physical infrastructure that the company has established to facilitate its operation.

Wal-Mart uses a hub and spoke distribution system to keep inventory at the optimum level. Wal-Mart has a network of regional distribution centers (hubs) that receive supplies from vendors and these supplies are cross docked at the distribution center and await Wal-Mart trucks for one day delivery to supported stores (spokes)²⁰. It should be noted that Wal-Mart does not use FedEx or UPS for routine re-supply to their retail stores. That would not be cost efficient.²¹ Inventory held at distribution centers is kept as low as possible to reduce costs and footprints. Buffer stocks are maintained at the distribution centers for items that have a history of demand surge.²² Decisions on where to place distribution centers are carefully made. Extensive analysis is conducted to determine the optimum location with factors such as the location of stores within the area, infrastructure of the road networks and rail system that will facilitate re-supply. Distribution centers are placed to be able to provide timely supply to all stores within a radius of 150 miles.²³ It is important to recognize that for Wal-Mart's initial expansion across the country, they would first decide where to establish the distribution center. Once the distribution center is established, Wal-Mart would then begin to fill in the surrounding area with stores that were within the radius of that

¹⁸ Jason Winne et al. "Walmart." (OPM Final Project. University of Syracuse 2003), 7.

¹⁹ Johnson, Contemporary Logistics, p16

²⁰ Walton, Made in America, p110

²¹ Wang, Accelerated Logistics, p23

²² Walton, Made in America, p110

²³ Ibid, p110

distribution center. This suggests that Wal-Mart understood that logistics had to be considered first; not as an afterthought.²⁴

Everything within Wal-Mart's distribution system is tied together via its automated system that allows suppliers, the warehouse, and stores to share information on stockage levels at the individual stores. But the physical distribution system is the backbone for the incredible success of Wal-Mart. Having a system that allows total asset visibility of supplies wherever they are in the chain and their own internal truck fleet with established routes and near guaranteed accessibility to their stores, provides Wal-Mart with incredible efficiency and flexibility. The key to Wal-Mart's success is the distribution system that they have taken the time to carefully establish. Another significant point in looking at Wal-Mart's success is the approach that is taken to establishing distribution centers. Wal-Mart views their distribution centers and their system of re-supply as something that gives them a competitive advantage over their competitors. They view the capital investment required to stand up these centers as a requirement to be successful in future operations and recognize that it gives them a strategic advantage over the competition.²⁵

Wal-Mart does not have a monopoly on good business ideas but it has distanced itself from its rivals. The individual parts of the distribution system that Wal-Mart uses are widely available for use by others, and they are used. What sets Wal-Mart apart is the way that they have integrated the parts of the system and made it work as a single integrated system versus several independent nodes. The designers of Wal-Mart's distribution understand the importance of having all of the pieces in place in order for the system to function as designed. This is a major challenge for the Army.

²⁴ Walton, p110

²⁵ Ibid, 206

Chapter Three: Future Force Concept

TRADOC Pamphlet 525-4-0 outlines the Army's concept for maneuver sustainment of the Future Force. This chapter covers some of the critical aspects that are identified as part of the Army's VM program. A global information network, in-transit visibility, configured loads and time definite delivery to the user will facilitate sustainment operations for the Future Force.²⁶ The idea is that the velocity of the distribution system will minimize the need to keep huge stockpiles throughout the theater. Sustainment footprints will also be reduced within the theater through demand reduction, improved reliability of systems, and improved business practices.

The maneuver sustainment environment will be characterized by discontinuous, temporarily established lines of communication and an increased reliance on aerial distribution. Sustainment pulses and unit cycling will be used to integrate unit sustainment activities with the unit battle rhythm. One of the requirements for success is the timely information flow of sustainment status and requirements from maneuver forces and the synchronization of sustainment activities with the unit's battle rhythm.²⁷

Distribution centric sustainment operations must be fully integrated with the maneuver sustainment picture. Space-based information systems will provide automated identification techniques, total asset visibility (TAV) and real time tracking of supplies. Civilian best business practices such as dynamic movement tracking and time definite delivery will continue to be incorporated into the system. Aerial transportation will provide responsiveness and agility throughout the theater. Improvements in ground transportations systems are aimed at providing logisticians with the capability to maintain pace with maneuver units.

To achieve success in sustainment operations, units must see first, understand first, and act first. Future Force sustainment units will see first by capturing needs of the soldier, combat

²⁶ United States Army Training and Doctrine Command. TRADOC Pamphlet 525-4, The United States Army Objective Force Maneuver Sustainment Operational and Organizational Concept. Fort Monroe, 2003, 27-28.

²⁷ Ibid, 15

weapons system, and supported commander through the use of a Common Operating Picture (COP) and total asset visibility of everything in the distribution system, and on the battlefield around them. A more effective digital command and control (C2) structure will facilitate this. The use of a COP will allow the Future Force sustainment Soldiers to understand first by allowing the Soldiers to see and understand what the maneuver commander is doing and allow them to anticipate his needs. TP 525-4-0 states that through collaboration of maneuver and sustainment headquarters, shared situational awareness (SA) and situational understanding (SU) will allow orders to be produced with fewer details and contribute to the speed of command.²⁸

Pulsed sustainment and unit cycling will be the primary means of providing sustainment for the Future Force. Pulsed sustainment is the synchronization of deliveries of sustainment supplies with the combat unit's battle rhythm. There is no longer a steady stream of supplies characterized by the daily LOGPAC.²⁹ Pulsed sustainment will provide replenishment every three to seven days depending on a unit's OPTEMPO.³⁰ Rapid in-stride replenishment or mission staging³¹ will be used for re-supply depending on the situation. Enhanced command and control, more efficient sustainment processes, enhanced diagnostic capabilities, more reliable equipment and a COP will increase the speed of replenishment operations.

Because of extended battlefield distances, there will be an increased reliance on aerial replenishment operations. While the primary method of replenishment will be for the supported and supporting units to move to a coordinated location outside of the decisive operations area, there

²⁸ Ibid, 23

²⁹ LOGPAC – Logistics Package; Grouping multiple classes of supply vehicles under a single convoy commander's control. Daily LOGPACs contain a standardized supply allocation. United States Army Command and General Staff College. ST 63-1 Brigade, Division, and Corps Combat Service Support, Ft. Leavenworth, July 2002

³⁰ OPTEMPO is an operations pace. United States Army Command and General Staff College. ST 63-1 Brigade, Division, and Corps Combat Service Support, Ft. Leavenworth, July 2002

³¹ Mission Staging is a deliberate, coordinated activity executed by maneuver sustainment elements from the UE.

may be times when this is not possible and there will be a need for the sustaining force to go to the supported unit using aerial assets.³²

The Future Force Battlefield Distribution System

The Future Force battlefield distribution system employs a hub and spoke method for distribution. An extensive information exchange network that will provide enhanced communications and digital linkage for sustainment and maneuver forces will support this system. The fundamental principles of the battlefield distribution system are velocity over mass, centralized management, optimization of the distribution system, maximum throughput, reduced customer wait time (CWT)³³, minimal essential stocks, maintaining a continuous, seamless, two-way flow of resources, and achieving time-definite delivery. Velocity over mass is the most important of all of the above principles in facilitating Future Force sustainment operations.³⁴ Within the Army, velocity over mass means that the size and quantity of stockpiles required within the theater of operations may be reduced in relation to the speed with which material is delivered from a source of supply to the end user. This will allow the Army to reduce its footprint by reducing the number of required supply and support activities (SSA).

Multi-nodal distribution operations and total asset visibility (TAV) will assist in Future Force sustainment operations. The senior sustainment commander will centralize distribution management in an effort to optimize the distribution infrastructure and leverage real time information. By maintaining visibility over stocks and distribution assets as well as a COP that will allow them to forecast operations, the sustainment commander will be able to prioritize assets and make decisions on what are the best of his available systems to support a given unit.

³² TRADOC Pam 525-4-0 p26

³³ Customer wait time is the time between when an order is placed by a unit and the time that they required material is delivered.

³⁴ United States Army Training and Doctrine Command. TRADOC Pamphlet 525-4, The United States Army Objective Force Maneuver Sustainment Operational and Organizational Concept. Fort Monroe, 2003, p26

The hub and spoke distribution system is the focal point of distribution activities at the operational level. Distribution within the area of operations (AO) will focus on rapid port clearance through the use of an inland distribution terminal that is connected with any number of supply support activities. The system is managed by a single distribution management agency. Improved information management techniques will provide the communications structure needed to control the flow of supplies. Time-definite deliveries and cross-docking techniques are critical to the success of this system.

Operation Iraqi Freedom: The Army's First Attempt

Operation Iraqi Freedom (OIF) does not represent the Future Force endstate but it does allow an opportunity to see how the Army did in attempting to implement Future Force sustainment concepts to support major combat operations (MCO). Iraqi Freedom was a huge departure from Operation Desert Storm (ODS) in the way that the war was fought and represents what the Future Force intends to achieve in war-fighting. ODS was a conflict that started with several months of build up prior to initiation of combat operations. The Army needed time to move several divisions from the United States to staging positions in Saudi Arabia. In addition to the units being moved there was time needed to build up the estimated 60 days of supply that logisticians believed should be on hand prior to initiation of MCO³⁵. For ODS units crossed the line of departure (LD) with an average of 60 days of supplies on hand. For OIF 5 days of supply was the average on hand quantity of supplies for units³⁶.

For ODS the distance that units had to travel to reach their final objectives were generally no more than 400 kilometers (km).³⁷ For OIF, Baghdad was the final objective and the

³⁵ Pagonis, *Moving Mountains*

³⁶ GAO, p12

³⁷ Richard M. Swain, *Lucky War: Third Army In Desert Storm*. Ft. Leavenworth: Command and General Staff College Press, 1994, p249

distances traveled were in excess of 600km.³⁸ During ODS the battlefield architecture was traditional in the sense that there were clear lines that delineated where the good guys and the bad guys were. As coalition forces moved into Iraq there was an established forward edge of battle area (FEBA) that identified where our forward combat forces were located. The area behind these forces was considered relatively safe and logisticians could freely move supplies forward as the maneuver formations advanced across a broad front leaving little room for anything that might provide resistance to follow on forces. OIF was different. In OIF there were three primary divisions. The British division had relatively short distance to travel to reach their initial objectives. But the Army's 3rd Infantry Division (3ID) and the Marine Division conducted deep penetrating attacks all the way to their objective; Baghdad. 3ID moved along a narrow front with speed characterizing their move. There were no divisions to their immediate left or right to provide protection. Precision airpower and guided munitions were the force multipliers that allowed the division to penetrate deeply into the heart of Iraq. The destructive capability of this combination was impressive, but the inherent security that was previously provided by a large force moving by ground and clearing everything in its path was no longer there.

Sustainment operations for OIF were challenged to keep pace with the fast moving maneuver formations of the 3ID. Lines of Communication (LOC) were stretched from Arifjan to Baghdad and supply convoys traveled great distances through what was now relatively unsecured territory. The Army's initial focus for sustaining the 3ID was re-supply of Classes I, III, and V. Class IX re-supply would occur as required with units digitally sending back their requisitions for supplies and those needed parts ordered and shipped forward as needed. For OIF, efficient distribution of supplies would be critical in this fast paced attack.

Before raising the question of whether or not we were effective in our attempts to use VM in a combat environment, we should consider some key points. As stated before, OIF is not

³⁸ Third Infantry Division (Mechanized) After Action Report: Operation Iraqi Freedom, 2003. available from <http://www.globalsecurity.org/military/library/report/2003/3id-aar-jul03.pdf> , p2

the endstate for the Army's sustainment transformation. There are currently plans to provide new automated systems for tracking supplies and communicating between supply activities and combat units. New truck systems are also on the horizon for the Army that should assist in helping transporters to keep pace with maneuver forces³⁹. But this discussion is not about hardware. It is about the system that is in place to provide the sustainment that is needed for our forces today. This system has been used successfully in a garrison environment since 1995⁴⁰ and the Army has applauded the remarkable success that it is in adding efficiency to our supply system. The concept of VM is here for the Army and it is the Army's current way of doing business. For OIF this is what we used and this is what we believed would be successful in sustaining our combat forces.

OIF Problems

*We built some iron mountains; we built some pockets of parts, and pockets of stuff waiting to be called forward. But because we were fighting so far, so fast, so furiously north, we didn't have pauses to allow us to get this stuff to them. Put another way, it's real easy to be FedEx when you have an address; it's real hard to distribute stuff when the address moves. And our address moved a lot in those nineteen, twenty days of conflict.*⁴¹

The Army is still in the process of completing comprehensive AAR's on OIF. While the Army's official AAR may still be several months away, there are some initial reports that provide insight into some of the problems encountered during Phase I thru Phase III operations. There are reports now available from the 3ID and the Marine Corps that express problems that they had with logistics during the operation. For this study we will focus on two reports that should provide a more comprehensive look at the operation. The General Accounting Office (GAO) has released an initial assessment that outlines significant problems with logistics during Phase One thru

³⁹ United States Army Training and Doctrine Command. TRADOC Pamphlet 525-4, The United States Army Objective Force Maneuver Sustainment Operational and Organizational Concept. Fort Monroe, 2003, 45

⁴⁰ Wang, Mark Y.D. *Accelerated Logistics: Streamlining the Army's Supply Chain*. (Santa Monica: Rand, 2004), xi

⁴¹ Randy R. Talbot, Operation Iraqi Freedom Phases I-III. Southwest Asia. United States Army Material Command Logistics Support Element, 2003, 256

Phase Three operations. Army Material Command's (AMC) Logistic Support Element has also released a detailed report on logistics problems that they encountered in supporting the operation. There are several areas that caused problems in supporting combat forces. These problems can probably be broken down into three primary areas. The first area is problems in the infrastructure and capabilities of transportation. The next area is technical problems that deal with the ability to take advantage of the concepts of VM. The last area is problems that occurred due to the environment that contributed to making support operations difficult.

Although major combat operations were successful, soldiers in OIF experienced a number of key logistics problems.⁴² OIF combat operations lasted substantially longer than Desert Storm and covered considerably more distance, which caused combat forces to be spread more thinly and supply lines to be longer. The strategic distribution system worked extremely well.⁴³ It worked so well that it may have contributed to the problems with theater distribution. Cargo flowed into the theater faster than it could be processed. This created significant backlog at the first theater interface, the theater distribution center.⁴⁴ When supplies arrived in country, there was an immediate problem with backlogged supplies. Supply yards became overwhelmed as supplies flowed in and began to grow into mountains of parts. As these mountains continued to grow, the ability to determine what was actually on hand became more and more difficult for logisticians in charge of processing the supplies. Newly arriving repair parts added to the massive piles of materials and made the task of actually identifying parts that were on hand very difficult.⁴⁵ One statistic from the GAO report drives this point home. There was a \$1.2 billion discrepancy between the amount of material ordered by Army activities in theater and the amount of material they

⁴² United States General Accounting Office. "Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities During Operation Iraqi Freedom. Washington, D.C., 2003, 1

⁴³ GAO,

⁴⁴ Randy R. Talbot, Operation Iraqi Freedom Phases I-III. Southwest Asia. United States Army Material Command Logistics Support Element, 2003, 110

⁴⁵ United States General Accounting Office. "Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities During Operation Iraqi Freedom. Washington, D.C., 2003, p2

received.⁴⁶ A forward support battalion (FSB) commander reported that in a 45 day period his unit placed 4000 requisitions and had received less than 25%.⁴⁷ The FSB commander's requisitions may have been received and his parts may have been in theater but the distribution system could not get them to him. The supplies were on the ground in the theater but the Army did not have the ability to process and distribute those supplies to the forward units. This critical aspect of the Army's distribution system, the ability to rapidly move supplies, that is crucial to the VM concept failed.

The reason for this failure can be tied directly to the initial development of the theater support infrastructure. Efficiency was impaired because the distribution system lacked sufficient skilled personnel (and appropriate tools) to breakdown "multi-pack" containers; identify contents, reconfigure and stage cargo into loads/convoys destined for onward movement to the appropriate users.⁴⁸ Intra-theater control of the distribution system was not synchronized and controlled by a single command dedicated solely to intra-theater distribution. One of the factors that contributed to this initial lack of capabilities due to not having the right people and equipment on the ground was that the normal time phased force deployment data (TPFDD) process was not followed for forces flowing into the theater.⁴⁹ Many of the critical sustainment troops did not arrive in theater until there were already significant problems with backlogged supplies. Sustainment operations were crippled from the onset by not putting skilled logisticians on the ground that would facilitate the operation of the Army's distribution center. The hub did not work.

Sustainment operations were further hampered by the lack of available transportation to move supplies from the TDC to the forward units. Distribution efforts were complicated initially by a lack of host nation transportation that was to make up 50% of the assets needed to deliver

⁴⁶ GAO, p14

⁴⁷ Talbot, p290

⁴⁸ GAO, p3

⁴⁹ Randy R. Talbot, Operation Iraqi Freedom Phases I-III. Southwest Asia. United States Army Material Command Logistics Support Element, 2003, 110

supplies from Kuwait forward.⁵⁰ In an effort to limit the size of the footprint within the theater, transportation assets were limited and this hindered efficiency.⁵¹ There were simply not enough transportation assets such as cargo trucks and material handling equipment to handle the volume of supplies in the theater. This contributed to a backlog of hundreds of pallets and containers of material at various distribution points. Another factor that contributed to this problem is that transportation managers overestimated the efficiency of the lift assets that they did have. They routinely underestimated the length of time it took to accomplish a given task.⁵²

Lack of support troops with the appropriate equipment to process and transport materials was a problem. There were additional technical problems that were present for the support units on the ground. One of the important aspects of VM is the use of technology to streamline procedures. Asset visibility is an aspect of this. The Army's idea of total asset visibility was not realized during OIF. Inconsistent use of RF tags meant that there were many items that were in the supply system that could not be tracked.⁵³ Inconsistent use of RF tags was a problem but even if they had been widely used throughout the operation, there were still problems that would have prevented peak efficiency. Bandwidth and communications infrastructure were not adequate to allow access to asset visibility and other logistics systems. Neither support units nor maneuver units had the ability to have true TAV. This was another important part of velocity management that was not realized.

Without an effective system in place to get repair parts forward to maneuver units there was an increased reliance on the prescribed load lists (PLL)⁵⁴ that units deployed with. As part of

⁵⁰ Walden, p16

⁵¹ Ibid, 236

⁵² Talbot, p110

⁵³ United States General Accounting Office. "Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities During Operation Iraqi Freedom. Washington, D.C., 2003, p2

⁵⁴ PLL – Prescribed Load List is the quantity of combat essential supplies and repair parts (other than ammunition) major commanders authorize to be on hand in units and that individuals or unit vehicles carry. The prescribed load is continuously reconstituted as used. (United States Army Command and General Staff College. ST 63-1 Brigade, Division, and Corps Combat Service Support, Ft. Leavenworth, July 2002), a-20

the Army's VM concept, units now have much smaller PLL's and this presented problems. In a garrison environment having a reduced PLL has been effective at reducing costs within the Army. The items that are on a unit's PLL are there because they are demand supported. This means that there are enough requests for a specific item within a given frequency, that a unit can justify keeping these items on the shelf. A similar concept applies to the Authorized Stockage List Level (ASL) at the next higher support level. The problem with deploying a unit to combat with a reduced PLL is that there is no time to adjust to the new demands that are generated in theater. In theory, as units require parts, they are able to drop requisitions for replacement parts and as they continue to order and receive parts, a demand history is built and their PLL's are adjusted to reflect this. As high demand items are established they can then be added to a unit's PLL so that the parts are now on hand when needed and the repair time is dropped dramatically. In OIF this did not work because as unit PLL's parts were used, they were not replenished through the supply system because new parts were never received. This now left units with no useable PLL and no incoming repair parts to replenish what was already a reduced PLL to start with. The AMC AAR cites multiple cases where units report that the only reason that they were able to survive as long as they did with repair parts through the system is that they brought significantly enhanced PLL's from home station in anticipation of problems receiving parts.⁵⁵

Once unit PLL's were diminished and units were not able to get repair parts, they were forced to resort to cannibalization of vehicles in order to keep their force moving. Major problems were reported with items such as tires, tracks for armored vehicles and batteries. In many cases if a vehicle was broken down and the part was not available to fix it, it was stripped and abandoned. Of particular note were a large number of trailers that support units carried loaded with test and

⁵⁵ Randy R. Talbot, Operation Iraqi Freedom Phases I-III. Southwest Asia. United States Army Material Command Logistics Support Element, 2003, , 298

diagnostic equipment. One maintenance officer estimated that “scrounging” for parts picked up 90% of the repair parts that his unit used during MCO.⁵⁶

One of the contributing factors to problems with the supply system was that the harsh desert environment caused problems and accelerated the consumption rates of some high use repair parts. The harsh and rugged desert environment requires a high standard of maintenance from equipment operators because the high temperatures placed increased stress on the equipment.⁵⁷ Regardless of the temperature, the pace of operations and the distances covered caused significant problems to the suspensions of both wheeled and tracked vehicles. The higher surface temperatures caused an increase of rubber and metal separation on road wheels and track pads.⁵⁸ Suspension problems also resulted from the high rate of speed that the vehicles maintained enroute to Baghdad. Vehicle weight also caused problems that led to increased requirements for suspension parts. Combat loaded vehicles are heavier than they are in normal training or a National Training Center environment. In combat, additional weight is added as vehicles are loaded with additional supplies and ammunition. Thin skinned vehicles such as HMMWV’s and supply trucks were loaded with additional armor plating and sandbags were placed in the beds of trucks and along the inside rails to provide protection from small arms fire. This additional weight over the long distances caused suspension failures in much of the wheeled fleet.⁵⁹ As suspension parts continued to fail on tracked and wheeled vehicles, unit maintenance personnel attempted to anticipate catastrophic failure and order replacement track for vehicles in their fleet. This never came. The idea with VM is that units order only what is needed and they shouldn’t stockpile or order supplies just in case. As mechanics identified worn shocks on tracked vehicle they understood that because of the high OPTEMPO, the other shocks were also probably on the verge of collapse and that this would in turn lead to problems that would increase the rate of wear on the track. A similar problem

⁵⁶ Ibid, 298

⁵⁷ Ibid, p226

⁵⁸ Talbot, p226

⁵⁹ Ibid, p225

could be seen as track pads began to wear out on vehicles. Mechanics would attempt to order entire replacement tracks for vehicles that were close to total failure but the system is designed for them to order only what is needed. It should be pointed out that an entire “roll” of track for an Abrams tank or Bradley Fighting vehicle is a significant load. The impact of trying to order replacement track for an entire company or battalion is significant and would require considerable transportation assets to move it forward. Both the GAO report and the AMC report highlighted the significance of this problem during the move to Baghdad.⁶⁰ A maintenance officer from the 3ID summarized the sustainment effort with his comments. “We cannot run off of a demand supply base. If we stayed at war for nine months then we could build a reliable history. The class IX support failed us this war, we moved so far so fast, it never caught up with us. We were promised re-supply by helicopter; not one part came on it”.⁶¹

There were indeed significant logistics problems during the Army’s drive to Baghdad but there was also success in logistics. It should be noted that both the GAO and AMC reports stated that with some minor exceptions, delivery of classes I, III, and V were readily available throughout the operation.⁶² What this suggests is that the Army did well at delivering bulk supplies that were on hand within the theater. Classes I, III, and V are items that logisticians can forecast and move forward with some regularity. If you have too many meals-ready-to-eat (MRE) on hand, you are not required to find a specific box of MRE’s to send forward to a specific unit. Any box will do. There is no need for an RF tag to tell you what is inside of a pallet of MRE’s. They are all the same. It is the ability to use technology to recognize what is on hand, organize it into packages for distribution, allocate the resources for movement of that package and get it forward that caused problems for the Army during OIF. The VM system that has worked so well for the garrison Army since 1995 failed during OIF.

⁶⁰ Ibid, p226; United States General Accounting Office, p5

⁶¹ Talbot, Operation Iraqi Freedom Phases I-III, p291

⁶² Ibid, p236

Business Problems with Velocity Management

In civilian industry, the just in time nature of VM requires inventory to arrive at the production lines with very little tolerance. The benefits are increased efficiency and profits but there are also risks involved. The terrorist attacks of September 11, 2001 gave many industry leaders an opportunity to witness some of the potential pitfalls of VM. The attacks on the World Trade Center and the Pentagon caused a shutdown of air travel around the country. The result of this was costly inventory shortages and plant shutdowns for many U.S. manufacturers⁶³. The automotive industry was hit particularly hard by the inability of aircraft to deliver supplies. Ford Motor Company had to shut down five of its U.S. plants because the company could not get enough engines and drive train parts from Canada. Ford's production for the fourth quarter dropped dramatically as a result.⁶⁴ The Chrysler Corporation suffered similar problems but made adjustments to mitigate some of the damages.

This potential for supply chain disruption means that VM supply systems are less predictable than most managers believe. A study by the Council of Logistics Management notes that approximately 60% of firms they queried about potential disruptions acknowledged that they had a formal contingency plan in place prior to 911. Preliminary studies suggest that even the existing formal contingency plans did not cover their supply chain adequately.

It is easy to suggest that the events of September 11th represent a very unique event and the likelihood of a similar disruption to the various transportation nodes is unlikely. But two studies by the Chartered Management Institute and the Business Continuity Institute show that there is evidence of significant disruption of supplies organizations from a number of crises in the

⁶³ Matt Hicks, "When the Chain Snaps." E-Week Enterprise News and Reviews. February 2002 [journal on line]; available from <http://www.eweek.com/article2/0,4149,1241019,00.asp;internet>

⁶⁴ Carla Griffy-Brown, "Just-in-Time to Just-in Case: Managing a Supply Chain in Uncertain Times." Graziadio Business Report. No 6, 2003

late 1990's through 2002.⁶⁵ Here are some examples that different industries, which rely on VM, have dealt with.

In November of 1998 Hurricane Mitch caused significant damage to banana plantations in Honduras, Guatemala, and Nicaragua. Flooding destroyed 10% of the worldwide crop of Bananas. Dole suffered significant revenue declines and struggled to find alternative sources to meet the demands of its customers.⁶⁶

In September of 1999 earthquakes in Taiwan caused production delays for Apple Computer. Power outages and damaged equipment halted the supply of components needed to manufacture computers. Apple faced product backlogs due to the component shortages and was not able to adjust to the problems caused by the earthquake.

In the spring of 2001 there was an outbreak of mad cow disease in England. Destruction of cattle caused shortages of European hides to leather goods manufacturers. Several leather companies including Gucci and Wilson Leather were unable to make adjustments to the unforeseen shortages and suffered significant losses.⁶⁷

Shortages caused by natural, political, or technological disruptions can erode productivity and even bring business to a halt. Following September 11th, it was clear that the disruptions to the nation's transportation system caused problems for several companies that operate on VM supply systems. A look at the events of September 11th, 2001 along with the other examples of unexpected events suggests that the companies discussed did not have the agility needed to adjust their supply systems to meet their

⁶⁵ Ibid

⁶⁶ BBC News, "Banana Losses Threaten Workers", Friday, 13 November 1998, Available at <http://news.bbc.co.uk/1/hi/business/theeconomy/212992.stm>

⁶⁷ Ibid

needs. Because of this, many civilian corporations are not abandoning their VM systems, but they are looking at ways to mitigate vulnerabilities within their systems.⁶⁸

⁶⁸ Hicks, When the Chain Snaps

Chapter Four: Findings and Recommendations

There is not much that is new to any trained logistician in the statements of lessons learned that I have included. There seems to me, however to be a good deal in them that has been forgotten or disregarded in the years since World War II when the accent has been on the economy and efficiency in peacetime operations as distinguished from preparations for effective operations in war.

General Carter B. Magruder, U.S. Army Retired⁶⁹

This study raises two primary questions. Can the Army effectively employ procedures that work in a civilian business environment to a military environment and does the TCP neglect the impact of friction? The current TCP does neglect the impact of friction. The literature suggests that technology will answer problems that have existed since the start of warfare through increased visibility and ultra-reliable systems that require fewer maintenance and parts. It briefs well but there is more work to be done. There is a lot of the battlefield that does not show up in satellite imagery and UAV feeds. If this is our method of protecting our supply convoys as they move across a non-contiguous battlefield then it is not enough and the concept at present does not appear to meet the survivability criteria. The future force asks fewer soldiers to do more. Recent operations in OIF have shown that this is problematic.⁷⁰ The current TCP seeks efficiency which means that there will likely be less redundancy in systems that are deployed to the theater and less ability for ground commanders to reconstitute lost assets. The enemy still gets a vote. We have not eliminated friction and the current technology does not reduce it. For the question of VM; the Army can make VM work. OIF represented a scenario where the system did not have a chance to work because it was never correctly established. There are some adjustments that must be made for a combat environment but the concept is sound if consideration is taken for the Army's unique environment.

Regardless of all the success of getting supplies, equipment and soldiers to the theater, the inability to effectively get the supplies forward has to be addressed and fixed. This quote is taken

⁶⁹ Carter B. Magruder, *Recurring Logistics Problems as I have Observed Them* Washington, D.C. United States Government Printing Office, 1991, p119

⁷⁰ Third Infantry Division (Mechanized) After Action Review: Operation Iraqi Freedom. July 2003. p87

from an Army Material Command newsletter as it addressed distribution during OIF.⁷¹ The article states that the swing to a just-in-time logistics system may have gone to far away from just-in-case supplies. Both the GAO and the AMC reports have made clear cases in stating that there were significant logistics shortfalls during combat operations during OIF. The AMC report paints a picture of material shortages that was so severe that tracked vehicles were on the verge of complete collapse due to a lack of repair parts for vehicle suspension systems. Battle Damage Assessment and Repair (BDAR) was the norm with a high number of vehicles being short-tracked⁷² in order to continue movement.

The Army's initial attempt at VM failed. There were numerous reasons for the failure. The theater sustainment forces were not deployed and allowed to establish the sustainment system that would have given a chance for VM to work. There were insufficient lift assets in the form of trucks and rotary winged platforms to move supplies forward to the maneuver forces.⁷³ Automated systems did not work as designed due to improper use and an inadequate number of systems throughout the theater. There was a lack of discipline in the use of RF tags that would have provided valuable information about incoming supplies and there were not sufficient automated systems available to the sustainers and customers to allow visibility of what could be tracked.⁷⁴ Lack of adequate PLL's and ASL's meant that when the supply system did not function there was nothing left for soldiers to fall back on after initial stockages were used. The lack of a single agency to coordinate theater logistics assets was also a problem.

The Army should not be afraid to continue with the transformation sustainment plan because of problems encountered during OIF. There was a need for change and the Army cannot expect to continue to evolve as a combat force and still use World War II type sustainment

⁷¹ Ibid

⁷² Short tracking is removing sections of a vehicle's track because the vehicle is missing one or more road wheels.

⁷³ Talbot, p132; General Accounting Office, p3

⁷⁴ Walden, The Forklifts Have Nothing To Do! P19; General Accounting Office, p3

processes. But in order for a logistics transformation to be successful, there are some things that the Army must get right.

The solutions to these problems will come as no surprise. General (R) Carter B. Magruder captured his thoughts on logistics problems that spanned his career. His notes covered a period that spans as far back as World War II and continued up until just prior to 1970. A review of some of his major points will find that his observations are in many cases not much different from the recommendations found in the GAO and AMC reports. Many of these same observations are also present in various monographs written by students at the Command and General Staff College and the Army's War College.⁷⁵ Magruder states that there is not much new in logistics lessons learned; just much that has been forgotten or disregarded. With that in mind, we can again explore some of the same recommendations that Magruder offered 25 years ago. In addition, the adjustments that civilian corporations made following disruptions to their supply systems in the 90's and after September 11th may also offer some insight. These recommendations will fall in three general categories. The organization of the distribution system or warehouse, the automation required to support the system and the transportation assets needed to move supplies.

Civilian Solutions

Before offering solutions to the Army's problems with VM, it may be useful to first look at how some civilian companies reacted to disruptions in their supply chains. The biggest shift that companies had to make post September 11th was to review their current systems and design new systems that would account for problems that they had not considered. Companies that relied heavily on air transportation had to consider the impact of having all of their air transportation

⁷⁵ Curran, "Future Tactical Truck System Maximization: Achieving Objective Sustainment and Distribution Requirements"; Jason R. Vick, "Can trucks Sustain the Objective Force?", Ft. Leavenworth, KS. School of Advanced Military Studies, U.S. Command and General Staff College, 2002; Perry L. Knight, Observations on Operation Enduring Freedom – Recommendations for the Development of the Transformation Objective Force Logistics Structure. Carlisle Barracks, U.S. Army War College, 2003

capability shut down. Companies that depended heavily on rail or trucks for movement of their supplies had to consider working without their primary mode of re-supply.⁷⁶

In chapter four of this paper there were examples given of different types of corporations that experienced supply chain disruptions. For each one of those companies that experienced problems that led to significant loss of operating capacity, there were other companies within the same segment of industry that dealt with the same crisis and made an adjustment to reduce the impact of their problem.

When Hurricane Mitch destroyed banana plantations in Central America and caused Dole to suffer significant revenue decline; Chiquita was able to leverage alternative sources through existing agreements and maintain a supply of bananas and maintain scheduled deliveries.⁷⁷ When Apple computer suffered backlogs due to shortages caused by the earthquake in Taiwan, Dell was able to influence demand toward products that they had readily available through an aggressive sales program that shaped the products that their consumers now wanted. This was not a direct solution to their supply problem but it was an innovative way to prevent the appearance that they were not able to meet the demands of their customers.⁷⁸ They had a contingency plan. When Gucci and Wilson Leathers suffered from a shortage of leather due to the outbreak of mad cow disease, Dehner Boots was able to rely on in stock inventories to continue production. When Ford Motor Company was forced to shut down production facilities for five days because they could not get engines and transmissions from Canada, Chrysler responded to the air restrictions by turning to truck deliveries. This did cause a delay for Chrysler but it allowed them to continue production when Ford could not.⁷⁹

Civilian companies have recognized that they need the flexibility to adjust to unforeseen problems. Civilians are now doing what the military has historically done very well; contingency

⁷⁶ Hicks, "When the Chain Snaps

⁷⁷ Griffy-Brown, "Just-in-Time to Just-in Case"

⁷⁸ *ibid*

⁷⁹ Griffy-Brown, "Just-in-Time to Just-in Case"; Joseph Martha, "Creating a Just-in Case Supply Chain for the Inevitable Next Disaster." Mercer Management Journal. no 14

plan. Companies that traditionally shipped via one mode are now considering backup plans by other modes. This may raise cost and affect production lead time but the balance between flexibility and extra cost is part of the new just-in-time equation.⁸⁰

Following the attacks on September 11th, many companies have begun to look at how they manage inventory levels. Some have made concessions to strict efficiency and created buffers in their system. Some have managed this by carrying more inventory than they did prior to September 11th or through agreements with their suppliers to carry more at their location. Others have increased lead times for the arrival of parts by ordering earlier and accepting the fact that their system is not running at optimal efficiency in exchange for the assurance that minor disruptions in their supply chain will not have a major effect on their operation.⁸¹ In short, many civilian companies are exploring just-in-case solutions to their problems with just-in-time logistics.

Technology

The following is an excerpt from the AMC AAR in reference to the use of RF tags:

The mandate for RF tags has got to be in place and in force. Experience in theater has shown that many containers and items arrived in theater without RF ID tags or with RF ID tags that were never read. Additionally, there were many containers that came in theater with RF ID tags attached, but when you got down to Level IV Data, the tags were not correct (e.g. containers that were tagged to reflect tubing as the contents, when opened were found to contain plywood). RF tags need to be accurate. A little more time in the rear during the shipping phase saves days, if not weeks, of delay within the theater. During the execution of an operation, that time can be the difference between life or death or success or failure.⁸²

This statement highlights a failure to give the system a chance to work. If the Soldiers at the user level do not embrace technology, VM will not work. This is a training issue and that is not the focus of this study. But this is also an issue of availability of assets across the board to allow soldiers to train and gain confidence in the systems. There must be enough systems in the inventory to train Soldiers on their use, and in doing so, educate them on the importance of taking

⁸⁰ Ibid

⁸¹ Hicks, "When the Chain Snaps."

⁸² Ibid, 132

the time to ensure that they are preparing packages on their end that will assist the forward deployed units when they receive them. The significance of RF tags is that not only do they provide asset visibility and speed the processing of equipment, but they also build flexibility into the system. Use of RF tags must become the norm in the Army.

Another problem experienced during OIF was the lack of sufficient systems to allow tracking of assets. The GAO report states that units in theater did not have adequate access to, or could not fully use, DOD's logistics and asset visibility systems in order to track equipment and supplies because the systems were not fully interoperable and capable of exchanging information. In addition to a shortage of systems at various levels, there was also a problem with the inability of Soldiers using the systems to take full advantage of their capabilities due to lack of training.⁸³ In order for a VM system to function effectively it must have the linkage of parts that is provided by the automated systems that support it. The Army must invest in the systems that will provide the communications architecture that is needed to control and manipulate the system.

Theater Support Structure

...automated technology was not the revolution in business at all; automated warehouses and distribution centers were the key. What ultimately delivered the goods was the shipping infrastructure. The warehouses, trucks, highways, planes and the people who operated them were the key.

This statement is taken from Chapter Four in the discussion about the key to success in distribution being a well organized, well functioning distribution center to process material. Magruder seems to say the same thing in his notes from 1968. He states, "well trained logistics troops are a critical requirement in war at the opening of a theater of operations. Without them, even if there is no fighting, unloading of shipping will be delayed and supplies will accumulate

⁸³ GAO, 3

unsorted and unidentified and therefore unusable”.⁸⁴ If in fact the Army is to have a “hub-and-spoke” distribution system there must be a functioning hub.

The Army must invest considerable energy in determining what the appropriate support architecture is for the theater. The location of the TDC, the manning, and the required connectivity throughout the theater are critical pieces that the Army must get right at the start of operations. The TPFDD arguments over who goes first should start with a discussion of the impact of a non-functional supply system. If this is an acceptable risk then business as usual is fine. But the Army cannot continue to try and do operations on the cheap when it comes to the logistics support infrastructure. As the Transformation Campaign Plan continues to develop, a hard look should be taken at where the Army has logistics transformation on its list of priorities. Our combat systems have proven that they are still the best the world has to offer. The Army will not lose any conflict in the near future because the Abrams tank, the Bradley Fighting Vehicle, or the Apache helicopter was just not good enough. None of those systems failed when called upon to execute during OIF. The logistics system did fail. The Army cannot have a reliable VM system without investing in the architecture across the force that is needed for it to work. Efficiency has a cost. The Army needs to put the right soldiers on the ground with the right equipment; early enough in the process to make VM work.

The GAO report and the AMC newsletter both point to a need for a single entity that is in charge of the distribution process. The AMC newsletter states that in order to be effective, a Distribution Management Center (DMC) must be a command position with authority over the material managers, the transportation managers, and the transportation assets.⁸⁵ This is a must if the Army, and the military in general, are to ever achieve unity of effort in the sustainment arena. The AMC report suggests that the Theater DMC should include the Theater Material Management Center, the Theater Movement Control Agency, and the Theater Transportation Command.

⁸⁴ Magruder, *Recurring Logistics Problems as I have Observed Them*, 121

⁸⁵ Walden, “Distribution Organizations in Support of Operation Iraqi Freedom – A Logistics Leader’s Perspective.” 4, o 2 (2003)

Centralized control of these assets should provide the Theater Support Commander with the visibility to identify problems as they arise and the flexibility to shift assets in response. The GAO report states that the Secretary of Defense has designated the U.S. Transportation Command a single distribution process owner.⁸⁶ The Army's logistics community should continue to consider alternative solutions to this issue.

A final issue on the theater architecture is the question of where TDC's are located within the theater and whether or not the intended operations of the Future Force conflict with VM concepts. Within civilian systems, one of the key considerations in the placement of TDC's is deciding where the facilities should be placed in reference to the location of the supplier and the retailer. The greater the transportation time is for moving supplies forward, the less flexibility the system has and the greater the need for larger stockpiles of supplies with the retailer.⁸⁷ The intent of the Future Force to operate in increased battlespace will prevent the flexibility that is desired in a VM system and stress the ability of sustainers to meet the requirements of the force.

Transportation Assets

The plan for improving the Army's transportation assets must also be examined. Trucks were a major issue during ODS and they were an issue for OIF.⁸⁸ The lack of available trucks contributed to the mountains of supplies that lay in the desert because there was not enough available transportation to move supplies out to the "spokes". In the earlier look at Wal-Mart's distribution system, the benefit of having dedicated trucks to deliver supplies was shown to be crucial to the company's success.⁸⁹ The Army does not have enough trucks to meet the demands of our force. If the answer is host nation support then it comes with considerable risk. The TCP

⁸⁶ Talbot, Operation Iraqi Freedom Phases I-III, 6

⁸⁷ Patton, Marketing Logistics, p157

⁸⁸ General Accounting Office, p3; United States General Accounting Office. "Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities During Operation Iraqi Freedom. Washington, D.C., 2003, p12

⁸⁹ Walton, 209

states that future sustainment operations will rely on the use of host nation and allied support for sustainment. It goes on to say that we cannot rely on host nation and allied arrangements that are not documented in written agreement and rehearsed periodically to assure operational execution. This almost assumes that we will always be able to get host nation support. Following ODS, LTG (R) William (Gus) Pagonis who was the Army's lead logistician for the operation stated that negotiations with host nations were as much about political relations and diplomacy as they were about goods and services. The capability may be there but we may not always have access to it, and if our plan depends on other people's assets, we may fall short. OIF demonstrated the fragility of this concept.

The Army encountered problems with host nation support because Kuwaiti national trucks were not allowed to cross the Iraqi border. If Kuwaiti trucks were loaded with supplies that were destined for soldiers across the Iraqi border, the trucks would have to be unloaded and re-loaded onto military trucks.⁹⁰ This process of cross-loading supplies is a stark contrast to the desired operation of VM. This VM principle of reducing wasted motion was violated during OIF.⁹¹

The DOD's inability to gain an agreement with Turkey over access through their country prior to OIF was another example of expected host nation support not materializing. Aside from political sensitivities, there are also some places where the host nation support that we are accustomed to tapping into simply may not be available. We cannot bring Camp Doha to the next fight.

The risks involved with operating over extended distances with non-contiguous boundaries between friendly forces should also be considered. The Future Force concept will have support Soldiers operating with more autonomy than they currently have. The Army must expect losses to some of these forces as they operate in environments that are not controlled by friendly forces. Using pulsed sustainment concepts, a single truck or section of trucks, may be used to re-supply

⁹⁰ Walden, *The Forklifts Have Nothing To Do!*, p16

⁹¹ *Ibid*, p79

multiple units over the course of 3 to 5 days. What is the impact of the operation if one of these trucks or a convoy of these trucks is lost? The Future Force may actually require more trucks in the Army's inventory because the risk to them will now be increased as we ask them to take on a riskier mission than what we currently ask them to do.

TRADOC Pamphlet 525-4-0 states that because of increased distances there will be an increased need for aerial re-supply.⁹² This makes sense, but the Army should ensure that the aviation community is on line to support this new requirement. In order to ensure that the lift assets are available when needed by the logisticians, these aircraft must be dedicated to the sustainment mission. The AMC report states that units were briefed that they would receive aerial replenishment but it never happened. Helicopters are valuable assets and there are never enough. There are still unanswered questions about the exact endstate of Army Aviation within the TCP but with the recent retirement of UH-1 helicopters in the Army inventory, the number of helicopters has dropped by several hundred in recent years. The current number of UH-60 helicopters, which are so vital in the sustainment role, is not scheduled to increase until 2010; and then at a gradual rate.⁹³ Current operations in Iraq and Afghanistan are taking a toll on the readiness of the fleet and the present aircraft are expected to support the Future Force out through 2025.⁹⁴ The 3rd Infantry Division's OIF AAR highlights shortfalls in the number of aircraft that were available for their sustainment efforts in OIF.⁹⁵ The Army recently announced the cancellation of the Comanche Attack Helicopter (February 2004). This was the stated priority for Army Transformation and called for the introduction of 1200 aircraft by FY 2023-24.⁹⁶ With this program cancelled, this may free resources to address current shortfalls that exist in the Aviation community to conduct sustainment operations. If the current Aviation transformation plan does not address this new

⁹² TRADOC Pamphlet 525-4-0, 27

⁹³ John Pike, "Rotary Aircraft-Army Plans" 2001. available at globalsecurity.org/military/systems/aircraft/rotary-army.htm.

⁹⁴ Janes Defense

⁹⁵ Third Infantry Division AAR, p199

⁹⁶ Janes Defense

requirement then there may be disconnects with the transformation plan for the Aviation community and the support community.

In addition to problems with the numbers of helicopters, there is also an issue with relying on aerial re-supply in a hostile environment. Events in Phase IV operations of OIF are showing a vulnerability of our rotary winged assets in Iraq. As helicopters were lost to hostile fire during OIF, there were questions about the availability of defensive countermeasures for aircraft operating in Iraq. A suggestion to fit aircraft with defensive equipment would seriously over-simplify what is a complex problem. Operating in a hostile environment with compartmentalized terrain, or in an urban setting, will always present problems. Regardless of the number of aircraft or the countermeasures we equip them with; the Army must build redundancy into the sustainment system to allow flexibility in the event that we are not able to use air effectively.

This study has looked at the Army's business based sustainment concepts. Much of the discussion thus far has addressed what the Army wants to change and the associated challenges that OIF identified. The reasons for a logistics transformation are valid and the process should continue. But there are some cautions that should be heeded as the process continues. Since most of this paper has focused on business principles, it will conclude by discussing a couple of principles from a book that is widely read in civilian industry. Peter Senge wrote "The Fifth Discipline" in 1994.⁹⁷ Senge's central message is on changing the way that people think in order to change an organization. This change to their "mental model" will drive how their organization grows. Senge's book does not have the answer to Army transformation but there are two ideas that may be useful to consider to when looking at the Transformation Campaign Plan.

The first idea is that structure influences behavior. Senge states: "

Different people in the same structure tend to produce qualitatively similar results. When there are problems, or performance fails to live up to what is intended, it is

⁹⁷ Peter M. Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Currency and Doubleday, 1990.

easy to find someone or something to blame. But, more often than we realize, systems cause their own crisis, not external forces, or individual's mistakes".⁹⁸

This is something to consider in looking at the Army's problems with sustainment during OIF. The inability to build an effective theater logistics structure at the start of the operation had a direct effect on the logistics shortfalls that were encountered. After Action Reports by the General Accounting Office, the Army Material Command, and The Third Infantry Division all highlighted the fact that there were not sufficient resources to establish the logistics structure needed to sustain the operation.⁹⁹ The outcome of the logistics effort was determined before the war ever started. Several parts to the Army's sustainment system were identified as being problematic. Fixing these individual parts is important but there are no single source answers to the problems that were encountered during OIF. We could add RF tags, additional trucks and helicopters and give additional terminals to enhance asset visibility and still not solve the sustainment problems if our sustainment structure is not established at the start of operations to prevent a massive backlog of parts as parts begin to flow into the theater. For OIF the TDC was not able to function as designed until eight days into hostilities.¹⁰⁰

The second idea from Senge is controlled growth. Here is what Senge said about rate of growth within organizations:

For most American business people the best rate of growth is fast, faster, fastest. Yet, virtually all natural systems, from ecosystems to animals to organizations, have intrinsically optimal rates of growth. The optimal rate is far less than the fastest possible growth. When growth becomes excessive-as it does in cancer-the system itself will seek to compensate by slowing down; perhaps putting the organization's survival at risk in the process.¹⁰¹

This may be a good way to sum up where the Army is going with transformation. The optimal rate of transforming the Army is not necessarily the fastest rate. There are repeated references throughout the TCP and various pieces of Future Force doctrine that point to increased

⁹⁸ Ibid, p40

⁹⁹ GAO, p3; AMC, p132, p188

¹⁰⁰ Walden, The Forklifts Have Nothing to Do! p22

¹⁰¹ Ibid, 62

efficiency and reduced cost. In an attempt to be a part of a revolution in military logistics the Army may be missing the benefits of evolutionary change at a time when it can actually afford (because of our current status as the world's only true superpower) to take an evolutionary approach. The Army does place its own survival at risk by attempting to adopt a sustainment system from civilian organizations that has still not proven that it can survive when friction is introduced. The impact of the system failing for the Ford Motor Company was five days of production and a double-digit drop in production for one quarter.¹⁰² The impact of the system failing for the Army is far greater. The Army's cost is much higher than Ford's.

LTG (R) Pagonis stated:

In order for a logistics system to not be hopelessly fragile and liable to catastrophic breakdown, if it is to function under changing circumstances and be capable of switching from one objective to the next; if, in short, it is to be capable of coping with the uncertainty that is the result of enemy action, and as such inherent in war; a certain amount of redundancy, slack, and waste must not only be tolerated but deliberately built in.¹⁰³

This is counter to what the Army is attempting to achieve with VM. Large scale disasters remind us that the frictionless economy is a utopian vision, not reality. No supply chain strategy will eliminate risk, nor should it, as the cost would be too high.¹⁰⁴ The TCP accepts that the battlefield of the future will continue to offer the challenges that the Army has seen in OIF and that because of the Army's overwhelming advantages over the rest of the world, future opponents will continue to search for vulnerabilities to attack.

A supply system designed to operate at peak cost efficiency is a risky proposition. The theory is fine but the reality of the operating environment suggests that there will be times when external forces will prevent the system from operating as seamlessly as the Army would like. If the Army proceeds with VM it must commit the resources to building the systems needed to support it and operate it in the appropriate manner. It must also recognize that any system that is employs

¹⁰² Hicks, *When the Chain Snaps*

¹⁰³ Pagonis, *Moving Mountains*, 210-211

¹⁰⁴ Hicks, *When the Chain Snaps*.

will have to have enough tolerance to absorb unexpected disruptions to the system. Equally important is the notion that the limitations of the system are understood and in employment, planners must realize the tension that will always exist between operational objectives and sustainment capabilities. All of the individual parts are vital to the make-up of the system and attempting to operate the distribution system without putting the parts in place will not work. In addition, the Army must accept that effectiveness in supplying parts and supplies to the soldiers is the primary objective; not saving the most money.

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